

1 A method of producing an equid comprising the steps of:

- a. determining an estimated time of estrus of a female equid, said female equid having two uterine horns, each uterine horn having a tip and a follicle, and having a vagina, a uterus, and a rectum;
- 5 b. collecting equine sperm cells from a male equid;
- c. establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid;
- d. establishing a flexible probe having a sperm container;
- e. placing said flexible probe in the vagina of said female equid;
- 10 f. manipulating said flexible probe into said uterus of said female equid;
- g. guiding said flexible probe into a uterine horn of said female equid; and
- h. gently manipulating said flexible probe per rectum as it is guided deep within said uterine horn of said female equid to a location deep within said uterine horn of said female equid near the tip of said uterine horn;
- 15 i. artificially inseminating said female equid;
- j. fertilizing at least one equine egg within said female equid; and
- k. producing an offspring equid.

2 A method of producing an equid as described in claim 1 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male species of said equid comprises the steps of:

- 20 a. determining the sex characteristic of a plurality of said equine sperm cells; and
- b. sorting said equine sperm cells according to the determination of their sex characteristic,

25 and wherein said step of producing an equine offspring mammal comprises the step of producing an offspring equid of the desired sex.

3 A method of producing an equid as described in claim 2 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine

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insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage.

4 A method of producing an equid as described in claim 3 wherein said step of
 5 establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm
 10 cells relative to the typical artificial insemination dosage selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an equine insemination sample of no more than about twenty-five million sperm cells.

5 A method of producing an equid as described in claim 4 wherein said step of
 15 fertilizing at least one equine egg within said female equid comprises the step of fertilizing at least one equine egg within said female equid at success levels statistically comparable to the typical artificial insemination dosage.

6 A method of producing an equid as described in claim 5 wherein said step of
 20 establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the steps of:
 a. staining said equine sperm cells;
 b. sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry; and
 25 c. concentrating said sorted equine sperm cells.

7 A method of producing an equid as described in claim 6 wherein said step of sorting according to said sex of said equine sperm cells through the use of high

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speed flow cytometry comprises the step of collecting live sperm of the desired sex at the rate of at least nine hundred live sperm per second.

8 A method of producing an equid as described in claim 6 wherein said step of
 sorting according to said sex of said equine sperm cells through the use of high
 5 speed flow cytometry comprises the step of operating a high speed cell sorter at a
 pressure of at least about fifty pounds per square inch.

9 A method of producing an equid as described in claim 1 wherein said step of
 establishing an equine insemination sample containing at least some of said equine
 sperm cells from said male equid comprises the step of establishing an equine
 10 insemination sample containing at least some of said equine sperm cells from said
 male equid and having a low number of said equine sperm cells relative to the
 typical artificial insemination dosage.

10 A method of producing an equid as described in claim 9 wherein said step of
 establishing an equine insemination sample containing at least some of said equine
 15 sperm cells from said male equid and having a low number of said equine sperm
 cells relative to the typical artificial insemination dosage comprises the step of
 establishing an equine insemination sample containing at least some of said equine
 sperm cells from said male equid and having a low number of said equine sperm
 cells relative to the typical artificial insemination dosage selected from the group
 20 consisting of: an equine insemination sample of no more than about five million
 sperm cells, and an equine insemination sample of no more than about twenty-five
 million sperm cells.

11 A method of producing an equid as described in claim 4 wherein said step of
 establishing an equine insemination sample containing at least some of said equine
 25 sperm cells from said male equid comprises the step of establishing an equine
 insemination sample having a volume selected from the group: 0.2 ml or 1ml.

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- 12 A method of producing an equid as described in claim 7 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.
- 5 13 A method of producing an equid as described in claim 10 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.
- 14 An equid having a predetermined sex produced through use of a method as
 10 described in any of claims 4, 7, 11, or 12.
- 15 A method of producing an equid comprising the steps of:
- a. determining an estimated time of estrus of a female equid, said female equid having two uterine horns, each uterine horn having a tip and a follicle;
 - b. collecting equine sperm cells from a male equid;
 - c. establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid;
 - d. inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said
 20 uterine horn;
 - e. artificially inseminating said female equid;
 - f. fertilizing at least one equine egg within said female equid; and
 - g. producing an offspring equid.
- 16 A method of producing an equid as described in claim 15 and further comprising
 25 the step of ascertaining which uterine horn is ipsilateral to the preovulatory follicle and wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid

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comprises the step of inserting at least a portion of said equine insemination sample near the tip of said uterine horn ipsilateral to the preovulatory follicle.

- 17 A method of producing an equid as described in claim 15 wherein said step of artificially inseminating said female equid comprises the step of artificially inseminating said female equid on a single occasion close to ovulation.

- 18 A method of producing an equid as described in claim 17 wherein said step of artificially inseminating said female equid on a single occasion close to ovulation comprises the step of comprises the step of artificially inseminating said female equid both ipsi- and contra-lateral within the uterine horns of said equid.

- 19 A method of producing an equid as described in claim 15 wherein said steps of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn, artificially inseminating said female equid, and fertilizing at least one equine egg within said female equid are each accomplished in a field environment.

- 20 A method of producing an equid as described in claim 15 wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn comprises the step of inserting at least a portion of said equine insemination sample at a location selected from the group consisting of: within about one-half inch of the tip of said uterine horn, within about one inch of the tip of said uterine horn, and within about two inches of the tip of said uterine horn.

- 21 A method of producing an equid as described in claim 15 and further comprising the step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid.

- 22 A method of producing an equid as described in claim 21 wherein said step of

manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid comprises the step of administering a gonadotropin releasing hormone to said female equid.

23 A method of producing an equid as described in claim 22 wherein said step of
 5 artificially inseminating said female equid is accomplished at a time selected from the group consisting of: about thirty four hours after said step of administering said gonadotropin releasing hormone to said female equid, about forty hours after said step of administering said gonadotropin releasing hormone to said female equid, and between about thirty four hours to about forty hours after said step of
 10 administering said gonadotropin releasing hormone to said female equid.

24 A method of producing an equid as described in claim 21 wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn comprises the step of inserting said equine insemination sample within said uterine
 15 horn through the use of a flexible plastic artificial insemination pipette.

25 A method of producing an equid as described in claim 15 wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn comprises the steps of:

- 20 a. establishing a flexible probe having a sperm container;
 b. placing said flexible probe in the vagina of said female equid;
 c. manipulating said flexible probe into said uterus of said female equid;
 d. slowly guiding said flexible probe into a uterine horn of said female equid;
 and
 25 e. gently manipulating said flexible probe per rectum as it is guided deep within said uterine horn of said female equid to a location deep within said uterine horn of said female equid near the tip of said uterine horn.

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- 26 A method of producing an equid as described in claim 15 and further comprising
the step of confirming by transrectal ultrasonography the location at which said
step of inserting at least a portion of said equine insemination sample is
accomplished prior to accomplishing said step of artificially inseminating said
5 female equid.
- 27 A method of producing an equid as described in claim 15 wherein said step of
establishing an equine insemination sample containing at least some of said sperm
cells from said male equid comprises the step of establishing an equine
insemination sample having a low number of said equine sperm cells relative to the
10 typical artificial insemination dosage, and wherein said step of fertilizing at least
one equine egg within said female equid comprises the step of fertilizing at least
one equine egg within said female equid at success levels statistically comparable
to the typical artificial insemination dosage.
- 28 A method of producing an equid as described in claim 27 wherein said step of
15 establishing an equine insemination sample having a low number of said equine
sperm cells relative to the typical artificial insemination dosage comprises the step
of establishing an equine insemination sample selected from the group consisting
of: an equine insemination sample of no more than about five million sperm cells,
and an equine insemination sample of no more than about twenty-five million
20 sperm cells.
- 29 A method of producing an equid as described in claim 25 wherein said step of
establishing an equine insemination sample containing at least some of said sperm
cells from said male equid comprises the step of establishing an equine
insemination sample having a low number of said equine sperm cells relative to the
25 typical artificial insemination dosage, and wherein said step of fertilizing at least
one equine egg within said female equid comprises the step of fertilizing at least
one equine egg within said female equid at success levels statistically comparable
to the typical artificial insemination dosage.

- 30 A method of producing an equid as described in claim 29 wherein said step of establishing an equine insemination sample having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step of establishing an equine insemination sample selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an equine insemination sample of no more than about twenty-five million sperm cells.
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- 31 A method of producing an equid as described in claim 29 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the steps of:
- 10 a. determining the sex characteristic of a plurality of said equine sperm cells; and
- b. sorting said equine sperm cells according to the determination of their sex characteristic,
- 15 and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.
- 32 A method of producing an equid as described in claim 31 wherein said steps of determining the sex characteristic of a plurality of said equine sperm cells and sorting said equine sperm cells according to the determination of their sex characteristic comprise the steps of:
- 20 a. staining said equine sperm cells;
- b. sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry; and
- c. concentrating said sorted equine sperm cells.
- 25 33 A method of producing an equid as described in claim 32 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting live sperm of the desired sex at the rate of at least nine hundred live sperm per second.

- 34 A method of producing an equid as described in claim 32 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of operating a high speed cell sorter at a pressure of at least about fifty pounds per square inch.
- 5 35 A method of producing an equid as described in claim 32 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting equine sperm cells having the desired sex characteristic in a skim milk solution.
- 10 36 A method of producing an equid as described in claim 33 wherein said step of establishing an equine insemination sample containing at least some of said sperm cells from said male equid comprises the step of establishing an equine insemination sample having a low number of said equine sperm cells relative to the typical artificial insemination dosage, and wherein said step of fertilizing at least one equine egg within said female equid comprises the step of fertilizing at least one equine egg within said female equid at success levels statistically comparable to the typical artificial insemination dosage.
- 15 37 A method of producing an equid as described in claim 36 wherein said step of establishing an equine insemination sample having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step of establishing an equine insemination sample selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an equine insemination sample of no more than about twenty-five million sperm cells.
- 20 38 A method of producing an equid as described in claim 15 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the steps of:
- 25 a. determining the sex characteristic of a plurality of said equine sperm cells;

and

- b. sorting said equine sperm cells according to the determination of their sex characteristic,

and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.

39 A method of producing an equid as described in claim 25 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the steps of:

- a. determining the sex characteristic of a plurality of said equine sperm cells; and

- b. sorting said equine sperm cells according to the determination of their sex characteristic,

and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.

15 40 A method of producing an equid as described in claim 15 and further comprising the step of administering an equine pituitary extract to said to said female equid to enhance the probability at which said step of fertilizing at least one equine egg within said female equid occurs.

41 A method of producing an equid as described in claim 28 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.

42 A method of producing an equid as described in claim 30 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.

- 43 A method of producing an equid as described in claim 37 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.
- 5 44 An equid having a predetermined sex produced through use of a method as described in any of claims 31, 33, 35, 40, 41, or 43.
- 45 A method of sorting equine sperm cells according to a determination of their sex characteristic comprising the steps of:
- a. collecting equine sperm cells from a male equid;
 - 10 b. staining said equine sperm cells;
 - c. establishing a cell source which supplies said equine sperm cells to be sorted;
 - d. establishing a sheath fluid which is adapted to form droplets and which is compatible with said equine sperm cells;
 - 15 e. establishing a skim milk solution into which said equine sperm cells are collected;
 - f. discriminating between said equine sperm cells according to a determination of their sex characteristic;
 - g. entraining individual equine sperm cells in a droplet;
 - 20 h. sorting said droplets according to said sex of the individual equine sperm cells they contain; and
 - i. collecting equine sperm cells having the desired sex characteristic in said skim milk solution.
- 46 A method of sorting equine sperm cells according to a determination of their sex characteristic as described in claim 45 wherein said step of establishing a skim milk solution into which said equine sperm cells are collected comprises the step of establishing a solution containing a skim milk extender as a collection fluid.
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47 A method of sorting equine sperm cells according to a determination of their sex
characteristic as described in claim 46 wherein said step of establishing a skim
milk solution into which said equine sperm cells are collected further comprises the
step of establishing a solution containing about four percent egg yolk as a
5 collection fluid.

48 A method of sorting equine sperm cells according to a determination of their sex
characteristic as described in claim 45 wherein said step of establishing a sheath
fluid which is adapted to form droplets and which is compatible with said equine
sperm cells comprises the step of establishing a sheath fluid containing a hepes
10 buffered medium.

49 A method of sorting equine sperm cells according to a determination of their sex
characteristic as described in claim 45 wherein said step of sorting said droplets
according to said sex of the individual equine sperm cells they contain comprises
the step of sorting according to said sex of said equine sperm cells through the use
15 of high speed flow cytometry.

50 A method of sorting equine sperm cells according to a determination of their sex
characteristic as described in claim 49 wherein said step of sorting according to
said sex of said equine sperm cells through the use of high speed flow cytometry
comprises the step of collecting live sperm of the desired sex at the rate of at least
20 nine hundred live sperm per second.

51 A method of sorting equine sperm cells according to a determination of their sex
characteristic as described in claim 49 wherein said step of sorting according to
said sex of said equine sperm cells through the use of high speed flow cytometry
comprises the step of operating a high speed cell sorter at a pressure of at least
25 about fifty pounds per square inch.

52 A method of producing an equid involving sorted equine sperm cells wherein said

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sorted equine sperm cells are sorted according to a determination of their sex characteristic through a method as described in claim 45 and further comprising the steps of:

- a. determining an estimated time of estrus of a female equid, said female equid having two uterine horns, each uterine horn having a tip and a follicle;
- b. establishing an equine insemination sample containing at least some of said sorted equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage;
- c. non-surgically inserting at least a portion of said equine insemination sample in said female equid;
- d. artificially inseminating said female equid;
- e. fertilizing at least one equine egg within said female equid; and
- f. producing an offspring equid of the desired sex.

15 53 A method of producing an equid as described in claim 52 wherein said step of establishing an equine insemination sample containing at least some of said sorted equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step of establishing an equine insemination sample containing at least some of said
 20 equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an equine insemination sample of no more than about twenty-five million sperm cells.

25 54 A method of producing an equid as described in claim 53 and further comprising the step of ascertaining which uterine horn is ipsilateral to the preovulatory follicle and wherein said step of non-surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine insemination sample near the tip of said uterine horn

ipsilateral to the preovulatory follicle.

- 55 A method of producing an equid as described in claim 53 wherein said step of artificially inseminating said female equid comprises the step of artificially inseminating said female equid on a single occasion close to ovulation.
- 5 56 A method of producing an equid as described in claim 55 wherein said step of artificially inseminating said female equid on a single occasion close to ovulation comprises the step of comprises the step of artificially inseminating said female equid both ipsi- and contra-lateral within the uterine horns of said equid.
- 57 A method of producing an equid as described in claim 54 wherein said steps of
10 inserting at least a portion of said equine insemination sample near the tip of said uterine horn ipsilateral to the preovulatory follicle, artificially inseminating said female equid, and fertilizing at least one equine egg within said female equid are each accomplished in a field environment.
- 58 A method of producing an equid as described in claim 53 wherein said step of
15 establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.
- 59 An equid having a predetermined sex produced through use of a method as described in any of claims 45, 50, 53, 57, or 58.
- 20 60 A method of flow cytometry accomplished through use of a method as described in any of claims 45, 48, or 50.
- 61 An equine-adapted flow cytometer system for isolating desired cells comprising:
 - a. an equine sperm cell source which supplies cells to be analyzed by the flow cytometer;

- b. a chemically coordinated sheath fluid source which creates a sheath fluid environment for said equine sperm cells;
- c. a nozzle through which said equine sperm cells pass while subjected to said sheath fluid environment;
- 5 d. an oscillator which acts upon said sheath fluid as it passes through said nozzle;
- e. a cell sensing system which responds to said equine sperm cells;
- f. a equine sperm cell sorter discrimination system which acts to sort said equine sperm cells having a desired sex characteristic; and
- 10 g. a skim milk solution collector into which said equine sperm cells having the desired sex characteristic are placed.

62 An equine-adapted flow cytometer system for isolating desired cells as described in claim 61 wherein said skim milk solution collector comprises a solution containing a skim milk semen extender.

15 63 An equine-adapted flow cytometer system for isolating desired cells as described in claim 62 wherein said skim milk solution collector further comprises a solution containing about four percent egg yolk.

64 An equine-adapted flow cytometer system for isolating desired cells as described in claim 62 wherein said chemically coordinated sheath fluid source comprises a sheath fluid containing a hepes buffered medium.

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65 An equine-adapted flow cytometer system for isolating desired cells as described in claim 61 wherein said equine sperm cell sorter discrimination system comprises a high speed cell sorter.

66 An equine-adapted flow cytometer system for isolating desired cells as described in claim 65 wherein said a high speed cell sorter collects live sperm of the desired sex at the rate of at least nine hundred live sperm per second.

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67 An equine-adapted flow cytometer system for isolating desired cells as described in claim 65 wherein said a high speed cell sorter operates at a pressure of at least about fifty pounds per square inch.

68 A sexed sperm specimen produced through use of a system as described in any of claims 61, 62, 64, 65 or 66.

69 An equid having a predetermined sex produced through use of a system as described in any of claims 61, 62, 64, 65 or 66.

70 A method of producing an equid comprising the steps of:

- a. determining an estimated time of estrus of a female equid, said female equid having two uterine horns, each uterine horn having a tip and a follicle;
- b. collecting equine sperm cells from a male equid;
- c. determining the sex characteristic of a plurality of said equine sperm cells;
- d. sorting said equine sperm cells according to the determination of their sex characteristic;
- e. establishing an equine insemination sample containing at least some of said sorted equine sperm cells from said male equid;
- f. non-surgically inserting at least a portion of said equine insemination sample in said female equid ;
- g. artificially inseminating said female equid;
- h. fertilizing at least one equine egg within said female equid; and
- i. producing an equine offspring mammal of the desired sex.

71 A method of producing an equid as described in claim 70 wherein said steps of determining the sex characteristic of a plurality of said equine sperm cells and sorting said equine sperm cells according to the determination of their sex characteristic comprise the steps of:

- a. staining said equine sperm cells;

- b. sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry; and
- c. concentrating said sorted equine sperm cells.

72 A method of producing an equid as described in claim 71 wherein said step of
 5 sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting live sperm of the desired sex at the rate of at least nine hundred live sperm per second.

73 A method of producing an equid as described in claim 71 wherein said step of
 10 sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of operating a high speed cell sorter at a pressure of at least about fifty pounds per square inch.

74 A method of producing an equid as described in claim 71 wherein said step of
 15 sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting equine sperm cells having the desired sex characteristic in a skim milk solution.

75 A method of producing an equid as described in claim 70 wherein said step of
 20 establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an equine insemination sample of no more than about twenty-five million sperm cells.

76 A method of producing an equid as described in claim 72 wherein said step of
 25 establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine

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insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an
 5 equine insemination sample of no more than about twenty-five million sperm cells.

77 A method of producing an equid as described in claim 75 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.

10 78 A method of producing an equid as described in claim 76 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.

79 A method of producing an equid as described in claim 70 wherein said step of non-
 15 surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn.

80 A method of producing an equid as described in claim 71 wherein said step of non-
 20 surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn.

81 A method of producing an equid as described in claim 79 wherein said step of
 25 artificially inseminating said female equid comprises the step of artificially inseminating said female equid on a single occasion close to ovulation.

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- 82 A method of producing an equid as described in claim 80 wherein said step of artificially inseminating said female equid comprises the step of artificially inseminating said female equid on a single occasion close to ovulation.
- 83 A method of producing an equid as described in claim 81 and further comprising
5 the step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid.
- 84 A method of producing an equid as described in claim 82 and further comprising the step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid.
- 10 85 A method of producing an equid as described in claim 83 wherein said step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid comprises the step of administering a gonadotropin releasing hormone to said female equid.
- 86 A method of producing an equid as described in claim 84 herein said step of
15 manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid comprises the step of administering a gonadotropin releasing hormone to said female equid.
- 87 A method of producing an equid as described in claim 85 herein said step of artificially inseminating said female equid is accomplished at a time selected from
20 the group consisting of: about thirty four hours after said step of administering said gonadotropin releasing hormone to said female equid, about forty hours after said step of administering said gonadotropin releasing hormone to said female equid, and between about thirty four hours to about forty hours after said step of administering said gonadotropin releasing hormone to said female equid.
- 25 88 A method of producing an equid as described in claim 86 wherein said step of

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artificially inseminating said female equid is accomplished at a time selected from the group consisting of: about thirty four hours after said step of administering said gonadotropin releasing hormone to said female equid, about forty hours after said step of administering said gonadotropin releasing hormone to said female equid, and between about thirty four hours to about forty hours after said step of administering said gonadotropin releasing hormone to said female equid.

89 A method of producing an equid as described in claim 85 wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn comprises the steps of:

- a. establishing a flexible probe having a sperm container;
- b. placing said flexible probe in the vagina of said female equid;
- c. manipulating said flexible probe into said uterus of said female equid;
- d. guiding said flexible probe into a uterine horn of said female equid; and
- e. gently manipulating said flexible probe per rectum as it is guided deep within said uterine horn of said female equid to a location deep within said uterine horn of said female equid near the tip of said uterine horn.

90 A method of producing an equid as described in claim 86 wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn comprises the steps of:

- a. establishing a flexible probe having a sperm container;
- b. placing said flexible probe in the vagina of said female equid;
- c. manipulating said flexible probe into said uterus of said female equid;
- d. guiding said flexible probe into a uterine horn of said female equid; and
- e. gently manipulating said flexible probe per rectum as it is guided deep within said uterine horn of said female equid to a location deep within said uterine horn of said female equid near the tip of said uterine horn.

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91 An equid having a predetermined sex produced through use of a method as described in any of claims 70, 72, 74, 77, 78, 79, or 89.

92 A method of producing an equid comprising the steps of:

- a. determining an estimated time of estrus of a female equid, said female equid having two uterine horns, each uterine horn having a tip and a follicle;
- b. collecting equine sperm cells from a male equid;
- c. establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage;
- d. non-surgically inserting at least a portion of said equine insemination sample in said female equid;
- e. artificially inseminating said female of said equid;
- f. fertilizing at least one equine egg within said female equid at success levels statistically comparable to the typical artificial insemination dosage; and
- g. producing an offspring equid.

93 A method of producing an equid as described in claim 92 and further comprising the step of ascertaining which uterine horn is ipsilateral to the preovulatory follicle and wherein said step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid comprises the step of inserting at least a portion of said equine insemination sample near the tip of said uterine horn ipsilateral to the preovulatory follicle.

94 A method of producing an equid as described in claim 92 wherein said step of artificially inseminating said female equid comprises the step of artificially inseminating said female equid on a single occasion close to ovulation.

95 A method of producing an equid as described in claim 94 wherein said step of artificially inseminating said female equid on a single occasion close to ovulation

comprises the step of comprises the step of artificially inseminating said female equid both ipsi- and contra-lateral within the uterine horns of said equid.

96 A method of producing an equid as described in claim 92 wherein said steps of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn, artificially inseminating said female equid, and fertilizing at least one equine egg within said female equid are each accomplished in a field environment.

97 A method of producing an equid as described in claim 92 wherein said step of fertilizing at least one equine egg within said female equid at success levels statistically comparable to the typical artificial insemination dosage comprises the step of fertilizing at least one equine egg within said female equid at success levels selected from the group consisting of at least 90%, at least 81%, at least 75%, at least 65%, at least 60%, at least 57%, at least 40%, at least 35%, and at least 30%.

98 A method of producing an equid as described in claim 92 wherein said step of establishing an equine insemination sample having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step of establishing an equine insemination sample selected from the group consisting of: an equine insemination sample of no more than about forty million sperm cells, an equine insemination sample of no more than about fifty million sperm cells, and an equine insemination sample of no more than about one hundred million sperm cells.

99 A method of producing an equid as described in claim 94 wherein said step of establishing an equine insemination sample having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step of establishing an equine insemination sample selected from the group consisting of: an equine insemination sample of no more than about forty million sperm cells, an equine insemination sample of no more than about fifty million sperm cells, and

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an equine insemination sample of no more than about one hundred million sperm cells.

100 A method of producing an equid as described in claim 97 wherein said step of establishing an equine insemination sample having a low number of said equine sperm cells relative to the typical artificial insemination dosage comprises the step
5 of establishing an equine insemination sample selected from the group consisting of: an equine insemination sample of no more than about forty million sperm cells, an equine insemination sample of no more than about fifty million sperm cells, and an equine insemination sample of no more than about one hundred million sperm
10 cells.

101 A method of producing an equid as described in claim 92 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the steps of:

- a. determining the sex characteristic of a plurality of said equine sperm cells;
- and
- b. sorting said equine sperm cells according to the determination of their sex characteristic,

and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.

20 102 A method of practically producing an equid as described in claim 94 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the steps of:

- a. determining the sex characteristic of a plurality of said equine sperm cells;
- and
- 25 b. sorting said equine sperm cells according to the determination of their sex characteristic,

and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.

103 A method of producing an equid as described in claim 97 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the steps of:

- a. determining the sex characteristic of a plurality of said equine sperm cells;
- and
- b. sorting said equine sperm cells according to the determination of their sex characteristic,

and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.

10 104 A method of producing an equid as described in claim 102 wherein said steps of determining the sex characteristic of a plurality of said equine sperm cells and sorting said equine sperm cells according to the determination of their sex characteristic comprise the steps of:

- a. staining said equine sperm cells;
- b. sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry; and
- c. concentrating said sorted equine sperm cells.

105 A method of producing an equid as described in claim 104 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting live sperm of the desired sex at the rate of at least nine hundred live sperm per second.

106 A method of producing an equid as described in claim 104 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of operating a high speed cell sorter at a pressure of at least about fifty pounds per square inch.

107 A method of producing an equid as described in claim 104 wherein said step of sorting according to said sex of said equine sperm cells through the use of high

speed flow cytometry comprises the step of collecting equine sperm cells having the desired sex characteristic in a skim milk solution.

108 An equid having a predetermined sex produced through use of a method as described in claim 101.

5 109 A method of producing an equid comprising the steps of:

- a. determining an estimated time of estrus of a female equid, said female equid having two uterine horns, each uterine horn having a tip and a follicle;
- b. collecting equine sperm cells from a male equid;
- 10 c. establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid and having a low number of said equine sperm cells relative to the typical artificial insemination dosage selected from the group consisting of: an equine insemination sample of no more than about five million sperm cells, and an equine insemination
- 15 d. non-surgically inserting at least a portion of said equine insemination sample in said female equid;
- e. artificially inseminating said female equid;
- f. fertilizing at least one equine egg within said female equid; and
- 20 g. producing offspring equid.

110 A method of producing an equid as described in claim 109 and further comprising the step of ascertaining which uterine horn is ipsilateral to the preovulatory follicle and wherein said step of non-surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a

25 portion of said equine insemination sample near the tip of said uterine horn ipsilateral to the preovulatory follicle.

111 A method of producing an equid as described in claim 109 wherein said step of

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artificially inseminating said female equid comprises the step of artificially
 inseminating said female equid on a single occasion close to ovulation.

112 A method of producing an equid as described in claim 111 wherein said step of
 artificially inseminating said female equid on a single occasion close to ovulation
 5 comprises the step of comprises the step of artificially inseminating said female
 equid both ipsi- and contra-lateral within the uterine horns of said equid.

113 A method of producing an equid as described in claim 109 wherein said steps of
 non-surgically inserting at least a portion of said equine insemination sample in
 said female equid, artificially inseminating said female equid, and fertilizing at
 10 least one equine egg within said female equid are each accomplished in a field
 environment.

114 A method of producing an equid as described in claim 109 wherein said step of
 establishing an equine insemination sample containing at least some of said equine
 sperm cells from said male equid comprises the steps of:
 15 a. determining the sex characteristic of a plurality of said equine sperm cells;
 and
 b. sorting said equine sperm cells according to the determination of their sex
 characteristic,
 and wherein said step of producing an offspring equid comprises the step of
 20 producing an offspring equid of the desired sex.

115 A method of practically producing an equid as described in claim 111 wherein said
 step of establishing an equine insemination sample containing at least some of said
 equine sperm cells from said male equid comprises the steps of:
 25 a. determining the sex characteristic of a plurality of said equine sperm cells;
 and
 b. sorting said equine sperm cells according to the determination of their sex
 characteristic,

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and wherein said step of producing an offspring equid comprises the step of producing an offspring equid of the desired sex.

116 A method of producing an equid as described in claim 115 wherein said steps of determining the sex characteristic of a plurality of said equine sperm cells and sorting said equine sperm cells according to the determination of their sex characteristic comprise the steps of:

- a. staining said equine sperm cells;
- b. sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry; and
- c. concentrating said sorted equine sperm cells.

117 A method of producing an equid as described in claim 116 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting live sperm of the desired sex at the rate of at least nine hundred live sperm per second.

118 A method of producing an equid as described in claim 116 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of operating a high speed cell sorter at a pressure of at least about fifty pounds per square inch.

119 A method of producing an equid as described in claim 116 wherein said step of sorting according to said sex of said equine sperm cells through the use of high speed flow cytometry comprises the step of collecting equine sperm cells having the desired sex characteristic in a skim milk solution.

120 A method of producing an equid as described in claim 109 and further comprising the step of administering an equine pituitary extract to said to said female equid to enhance the probability at which said step of fertilizing at least one equine egg within said female equid occurs.

121 A method of producing an equid as described in claim 109 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.

5 122 A method of producing an equid as described in claim 110 wherein said step of establishing an equine insemination sample containing at least some of said equine sperm cells from said male equid comprises the step of establishing an equine insemination sample having a volume selected from the group: 0.2 ml, or 1ml.

10 123 A method of producing an equid as described in claim 92 wherein said step of non-surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn.

15 124 A method of producing an equid as described in claim 109 wherein said step of non-surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn.

20 125 A method of producing an equid as described in claim 111 wherein said step of non-surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn.

25 126 A method of producing an equid as described in claim 110 wherein said step of non-surgically inserting at least a portion of said equine insemination sample in said female equid comprises the step of inserting at least a portion of said equine

insemination sample deep within at least one of said uterine horns of said female equid near the tip of said uterine horn.

- 127 A method of producing an equid as described in claim 125 and further comprising the step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid.
- 128 A method of producing an equid as described in claim 126 and further comprising the step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid.
- 129 A method of producing an equid as described in claim 127 wherein said step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid comprises the step of administering a gonadotropin releasing hormone to said female equid.
- 130 A method of producing an equid as described in claim 128 wherein said step of manipulating the ovulation of said female equid prior to accomplishing the step of artificially inseminating said female equid comprises the step of administering a gonadotropin releasing hormone to said female equid.
- 131 A method of producing an equid as described in claim 129 wherein said step of artificially inseminating said female equid is accomplished at a time selected from the group consisting of: about thirty four hours after said step of administering said gonadotropin releasing hormone to said female equid, about forty hours after said step of administering said gonadotropin releasing hormone to said female equid, and between about thirty four hours to about forty hours after said step of administering said gonadotropin releasing hormone to said female equid.
- 132 A method of producing an equid as described in claim 130 wherein said step of artificially inseminating said female equid is accomplished at a time selected from

the group consisting of: about thirty four hours after said step of administrating
 said gonadotropin releasing hormone to said female equid, about forty hours after
 said step of administrating said gonadotropin releasing hormone to said female
 equid, and between about thirty four hours to about forty hours after said step of
 administrating said gonadotropin releasing hormone to said female equid.

133 A method of producing an equid as described in claim 129 wherein said step of
 inserting at least a portion of said equine insemination sample deep within at least
 one of said uterine horns of said female equid near the tip of said uterine horn
 comprises the steps of:

- a. establishing a flexible probe having a sperm container;
- b. placing said flexible probe in the vagina of said female equid;
- c. manipulating said flexible probe into said uterus of said female equid;
- d. slowly guiding said flexible probe into a uterine horn of said female equid;
- and
- e. gently manipulating said flexible probe per rectum as it is guided deep
 within said uterine horn of said female equid to a location deep within said
 uterine horn of said female equid near the tip of said uterine horn.

134 A method of producing an equid as described in claim 130 wherein said step of
 inserting at least a portion of said equine insemination sample deep within at least
 one of said uterine horns of said female equid near the tip of said uterine horn
 comprises the steps of:

- a. establishing a flexible probe having a sperm container;
- b. placing said flexible probe in the vagina of said female equid;
- c. manipulating said flexible probe into said uterus of said female equid;
- d. slowly guiding said flexible probe into a uterine horn of said female equid;
- and
- e. gently manipulating said flexible probe per rectum as it is guided deep
 within said uterine horn of said female equid to a location deep within said
 uterine horn of said female equid near the tip of said uterine horn.

- 135 An equid having a predetermined sex produced through use of a method as described in any of claims 114, 117, 119, 120, 121, 122, 123, 127, or 133.

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